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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,720	01/24/2002	Tomoki Kobayashi	IIW-016	2117

959 7590 06/01/2006

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EXAMINER	
RHEE, JANE J	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/056,720	KOBAYASHI ET AL.
	Examiner	Art Unit
	Jane Rhee	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-25* is/are pending in the application.

4a) Of the above claim(s) *22 and 23* is/are withdrawn from consideration.

5)☒ Claim(s) *20 and 21* is/are allowed.

6)☒ Claim(s) *1-12,14-19,24 and 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 22,23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected apparatus, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 3/15/2006.

Rejections Withdrawn

2. The claim objection to claim 11 has been withdrawn due to applicant's amendment filed on 3/15/2006.

3. The 35 U.S.C. 101 rejection of claims 12,14-19 has been withdrawn due to applicant's amendment filed on 3/15/2006.

4. The 35 U.S.C. 112 1st paragraph rejection of claims 9 and 10 has been withdrawn due to applicant's amendment filed on 3/15/2006.

5. The 35 U.S.C. 112 2nd paragraph rejection of claims 12,14-19 has been withdrawn due to applicant's amendment filed on 3/15/2006.

Rejections Repeated

6. The 35 U.S.C. 103(a) rejection of claims 1,4,8-10 unpatentable over Okada et al. in view of JP 60-68 has been repeated as previously made in office action 11/18/2006.

7. The 35 U.S.C. 103(a) rejection of claims 12,14,15,18,19 unpatentable over Okada et al. in view of JP 60-68 and in further view of Kralick and Aldhart et al. has been repeated as previously made in office action 11/18/2006.

8. The 35 U.S.C. 103(a) rejection of claims 16,17 unpatentable over Okada et al. in view of JP 60-68 and Kralick and Aldhart et al. and in further view of Pratt et al. has been repeated as previously made in office action 11/18/2006.

9. The 35 U.S.C. 103(a) rejection of claims 2,3,5,11 unpatentable over Okada et al. in view of JP 60-68 and in further view of Kralick has been repeated as previously made in office action 11/18/2006.

10. The 35 U.S.C. 103(a) rejection of claims 6 and 7 unpatentable over Okada et al. in view of JP 60-68 and in further view of Pratt et al. has been repeated as previously made in office action 11/18/2006.

11. The 35 U.S.C. 103(a) rejection of claim 24 over Okada et al. in view of JP 60-68 and in further view of Monette et al. has been repeated as previously made in office action 11/18/2006.

12. The 35 U.S.C. 103(a) rejection of claim 25 over Okada et al. in view of JP 60-68 and Monette et al. in further view of Derwent abstract for JP 90061401 has been repeated as previously made in office action 11/18/2006.

Response to Arguments

13. Applicant's arguments filed 3/15/2006 have been fully considered but they are not persuasive.

In response to applicant's argument that Okada et al. and JP 60-68 do not teach or suggest that the hydrogen discharged from the high pressure tank is provided to the hydrogen occlusion alloy tank and the heat generated in the hydrogen occlusion alloy during the course of storing the hydrogen gas into the hydrogen occlusion alloy tank is

transferred to the fuel cell to thereby warm up the fuel cell, Okada et al. discloses that the hydrogen which is to be absorbed with the hydrogen storage metal alloy is supplied as a starting material hydrogen into the tank 4 by connecting a high-pressure hydrogen cylinder to a hydrogen supplying outlet followed by opening the valve V1 whereupon the hydrogen storage metal alloy absorbs the hydrogen from the low-pressure plateau region to the high-pressure plateau region (col. 17, line 65 to col. 18, line 7 and col. 19, lines 8-32). Okada et al. fail to disclose heat-transmitting means which transmits heat generated in the hydrogen-occlusion alloy during the course of storing the hydrogen gas from the high pressure hydrogen gas tank in order to warm up the fuel cell, and that the pressure of the hydrogen gas discharged from the high pressure tank is about 25 MPa. The JP 60-68 A reference discloses a fuel cell apparatus comprising a fuel cell 15, a metal hydride 13 having a high hydrogen equilibrium dissociation pressure placed in tank 4 and a metal hydride 14 having a low hydrogen equilibrium dissociation pressure in tank 10 and the two tanks are coupled to each other through hydrogen transfer valves 11 and 12 (see also Figure 2). A heat exchanger 18 is contained in tank 10 and is coupled with a heat exchanger 16 which heats and cools the fuel cell 15 (see page 5 of applicant's translation). Page 5 of the translation also states that a "solvent for exchanging heat is transferred by means of a pump to circulate solvent so that heat can be smoothly transferred." Page 6 of the translation states "the heat is generated in the metallic hydride MH1 when hydrogen is occluded in the metallic hydride MH1. This heat can also be utilized to increase the temperature of the fuel cell so that the fuel cell can be started again at the time when the fuel cell is stopped." Therefore, it would have

been obvious to one of ordinary skill in the art at the time the invention was made have a heat exchange arrangement between the hydrogen storage alloy tank and fuel cell of Okada et al. in the form of a heat exchanger on the hydrogen storage alloy tank coupled with a heat exchanger which heats and cools the fuel cell by means of a pump to circulate a solvent so that heat can be smoothly transferred to the fuel cell as taught by JP 60-68 in order to efficiently utilize the waste heat released from the hydrogen storage alloy during occluding of hydrogen from the high pressure gas tank in order to start up a fuel cell.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, both references teach heat transfer from the hydrogen storage metal alloy to the fuel cell. Applicant argues that these two references teach opposite heat transfer directions to address different problems, however, these two references do not teach opposite heat transfer direction. Even though Okada teaches a heat transfer from the exhaust of the fuel cell to the hydrogen storage metal alloy, there is *some* heat transfer from the hydrogen storage metal alloy to the fuel cell.

In response to applicant's request to provide documentary evidence to support Examiner's position of Official notice that the high pressure tank is commercially available in a variety of sizes and pressures in the hydrogen supply art, Patent number 4396114 teaches that hydrogen is stored conventionally as a gas in steel cylinders at high pressures (e.g. 13.79Mpa) and at lower pressures as a liquid in insulated containers (col. 1 lines 17-20). Patent number 6015065 teaches a hydrogen tank to withstand gas storage pressures of more than 335Mpa which allows hydrogen or methane to be quickly loaded and stored at gasoline energy density (col. 9 lines 32-36).

In response to applicant's argument that Kralick fail to disclose that the hydrogen discharged from the high pressure tank is provided to the hydrogen occlusion alloy tank and the heat generated in the hydrogen occlusion alloy during the course of storing the hydrogen gas into the hydrogen occlusion alloy tank is transferred to the fuel cell to thereby warm up the fuel cell, Okada et al. and JP 60-68 as discussed above teaches that the hydrogen discharged from the high pressure tank is provided to the hydrogen occlusion alloy tank and the heat generated in the hydrogen occlusion alloy during the course of storing the hydrogen gas into the hydrogen occlusion alloy tank is transferred to the fuel cell to thereby warm up the fuel cell. Kralick teaches water as a heat exchange medium between a fuel cell and a heat exchanger (col. 5, lines 30-31) and that if the reactant gas entering the inlet is warmer than the fuel cell stack, condensation might occur as the saturated gas is cooled to the stack temperature (col. 5, lines 45-65).

In response to applicant's argument that Pratt fail to disclose that the hydrogen discharged from the high pressure tank is provided to the hydrogen occlusion alloy tank

and the heat generated in the hydrogen occlusion alloy during the course of storing the hydrogen gas into the hydrogen occlusion alloy tank is transferred to the fuel cell to thereby warm up the fuel cell, Okada et al. and JP 60-68 as discussed above teaches that the hydrogen discharged from the high pressure tank is provided to the hydrogen occlusion alloy tank and the heat generated in the hydrogen occlusion alloy during the course of storing the hydrogen gas into the hydrogen occlusion alloy tank is transferred to the fuel cell to thereby warm up the fuel cell. Pratt et al. teach that the amount of hydrogen released from the metal hydride container has to be controlled such that it matches the target power output, pressure, and concentration of hydrogen in the fuel cell system (col. 1, lines 60-65).

In response to applicant's argument that Okada, JP 60-68, Kralick and Aldhart do not teach or suggest a configuration of warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy, wherein the cooling water for cooling the fuel cell passes outside of a tank contain the hydrogen occlusion alloy and is heated by the heat generated for warming up the fuel cell, Okada et al. and JP 60-68 teaches warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy as described above. Kralick teaches water as a heat exchange medium between a fuel cell and a heat exchanger (col. 5, lines 30-31) and that if the reactant gas entering the inlet is warmer than the fuel cell stack, condensation might occur as the saturated gas is cooled to the stack temperature (col. 5, lines 45-65). Aldhart teaches a fuel cell system with heat exchange between the coolant 74 and the metal hydride alloy tank which comprises two concentric containers

70 and 72 and the container 72 contains the metal hydride bed with container 70 surrounding container 72 and connected to the coolant system of the fuel cell stack (see Figure 6).

Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to use water as the solvent for exchanging heat between the fuel cell and the metal hydride tank 10 because water is commonly used in the art as a heat exchange medium in a coolant circuit because water is non-corrosive, has high heat capacity, is non-toxic, and is easily replenished by the product water of the fuel cell. Also, it would have also been obvious to one of ordinary skill in the art at the time the invention was made to warm up the fuel cell to a given temperature without power generation or to warm up the fuel cell to a given temperature with power generation because the optimum condition of power generation depends on the relative temperature of the humidified reactant and the temperature of the fuel cell because if a humidified reactant gas entering the fuel cell has a higher temperature that the fuel cell temperature, condensation might occur and cause flooding of the fuel cell membrane that would be detrimental to power generation. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the metal hydride alloy tank of Aldhart et al. in the fuel cell system of JP 60-68 A because the heat exchange unit 72 of the metal hydride alloy tank located outside of and surrounding the metal hydride bed provides more space for hydrogen storage and more surface area for heat exchange with the metal hydride bed.

In response to applicant's argument that Pratt fail to disclose or teach warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy, wherein the cooling water for cooling the fuel cell passes outside of a tank contain the hydrogen occlusion alloy and is heated by the heat generated for warming up the fuel cell, Okada, JP 60-68, Kralick and Aldhart teach warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy, wherein the cooling water for cooling the fuel cell passes outside of a tank contain the hydrogen occlusion alloy and is heated by the heat generated for warming up the fuel cell as discussed above. Pratt et al. teach that the amount of hydrogen released from the metal hydride container has to be controlled such that it matches the target power output, pressure, and concentration of hydrogen in the fuel cell system (col. 1, lines 60-65).

In response to applicant's argument that Monette fail to disclose or teach warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy, wherein the cooling water for cooling the fuel cell passes outside of a tank contain the hydrogen occlusion alloy and is heated by the heat generated for warming up the fuel cell, Okada, JP 60-68, Kralick and Aldhart teach warming up the fuel cell by a heat generated during the occlusion of hydrogen in a hydrogen occlusion alloy, wherein the cooling water for cooling the fuel cell passes outside of a tank contain the hydrogen occlusion alloy and is heated by the heat generated for warming up the fuel cell as discussed above. Monette et al. teach that fiber reinforced plastic (FRP) composites are used for pressure vessels or above

ground storage tanks since they are superior in corrosion resistance compared to carbon steel, have improved fatigue resistance, and are considerably lighter weight for a given wall thickness than their steel counterparts (col. 1, lines 10-26).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Monette teaches that the fiber reinforced composites are useful in the construction of storage tanks, and Okada et al teaches a high pressure hydrogen tank. A high pressure hydrogen tank is a storage tank. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a high pressure tank formed of fiber reinforce plastic for storing hydrogen gas because fiber reinforced composites are superior in corrosion resistance compared to carbon steel, have improved fatigue resistance, and are considerably lighter weight for a given wall thickness than their steel counterparts (col. 1, lines 10-26).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jane Rhee whose telephone number is 571-272-1499. The examiner can normally be reached on M-F 9-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jane Rhee
May 18,2006

DAH-WEI YUAN
PRIMARY EXAMINER